Montana Department of Environmental Quality

Water Protection Bureau
P.O. Box 200901
Helena, MT 59620-0901

PERMIT FACT SHEET

MONTANA GROUND WATER POLLUTION CONTROL SYSTEM (MGWPCS)

Permittee:	Park 520 Hotel LLC
Permit Number:	MTX000248
Permit Type:	Domestic wastewater
Application Type:	New
Facility Name:	Park 520 Hotel
Facility Location:	NW 1/4 , Section 15, T12S, R5E, Gallatin County Latitude: 44.789879° Longitude: -111.112108°
Facility Address:	155 Einos Loop, West Yellowstone, MT 59758
Facility Contact:	Yanxin Liu
Treatment Type:	Level 2, Eliminite Media-Trickling Filter System
Receiving Water:	Class I Ground Water
Number of Outfalls:	1
Outfall / Type:	001 is an Elevated sand mound
Effluent Type:	Domestic strength wastewater
Mixing Zone:	Standard 500 foot
Effluent Limit Type:	WQBEL
Effluent Limits:	Total nitrogen: 3.8 lbs/day
Flow Rate:	Design maximum: 16,000 gpd Design average: 16,000 gpd
Effluent sampling:	EFF 001, Quarterly monitoring
Ground water sampling:	Quarterly MW-1 and MW-2
Fact Sheet Date:	May 1, 2019
Prepared By:	Rich Morse

1.0 Permit Information

DEQ issues MGWPCS permits for a period of five years. The permit may be reissued at the end of the period, subject to reevaluation of the receiving water quality and permit limitations. This fact sheet provides the basis for DEQ's decision to renew a MGWPCS wastewater discharge permit Park 520 LLC (applicant) for the Park 520 Hotel wastewater treatment system.

1.1 Application

DEQ received an application for renewal of the permit on April 29, 2019. Renewal fees accompanied the application. DEQ reviewed the submittal and issued a completeness letter on April 30, 2019.

2.0 Facility Information

2.1 Location

The Park 520 wastewater treatment system is located approximately ten miles north of West Yellowstone Montana on Highway 191 (**Figure 1**).

Figure 1. Location of the Park 520 Hotel

Figure 2. Park 520 Hotel Site Location

Park 520 Hotel will be discharging domestic in nature waste water to a raised sand mound outfall. Waste water is discharged from 25 four unit rental cabins serving the seasonal tourist business. Maximum design discharge is 16,000 gallons per day.

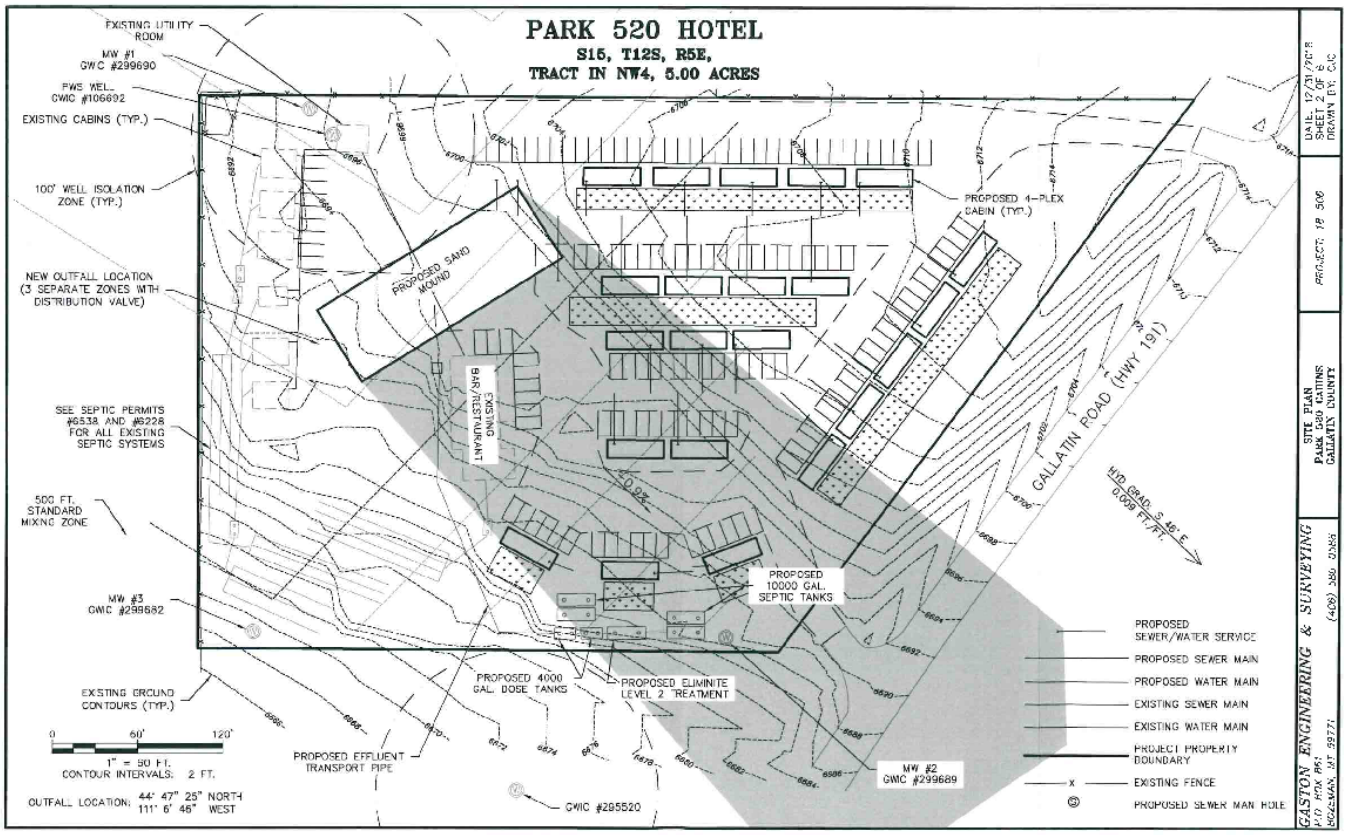


Figure 3. Park 520 Hotel Site Plan

2.2 OPERATIONS

System operations are summarized in **Table 1**.

Table 1. Collection, Treatment, and Disposal Summary

Collection	
Contributing sources:	100 motel rooms contained in 25 buildings having four units per building.
Standard industrial code(s) of sources:	7011 Hotels and Motels
Collection method:	Gravity sewer lines to treatment
Flow volume:	Average daily design flow: 16,000 gallons per day Maximum daily design flow: 16,000 gallons per day
Treatment	
Treatment level:	Level 2 treatment
Treatment technology:	Wastewater moves to 40,000 gallons of storage followed by Level 2 Eliminite Media-Trickling Filter System to two 4,000 gallon dose tanks.
Treatment location:	Latitude: 44.789879° Longitude: -111.112108°
Disposal	
Method of disposal:	Infiltration to ground water
Disposal structure:	Raised Sand Mound (Outfall 001)
Outfall location:	Latitude: 44.790538° Longitude: -111.112634°

Effluent monitoring is done in the dose tank prior to discharge to the elevated sand mound. Flow monitoring is done after the dose tank.
Monitoring and sampling requirements are further discussed in **Section 6**.

Figure 4 is a line drawing of the collection, treatment, and disposal process.

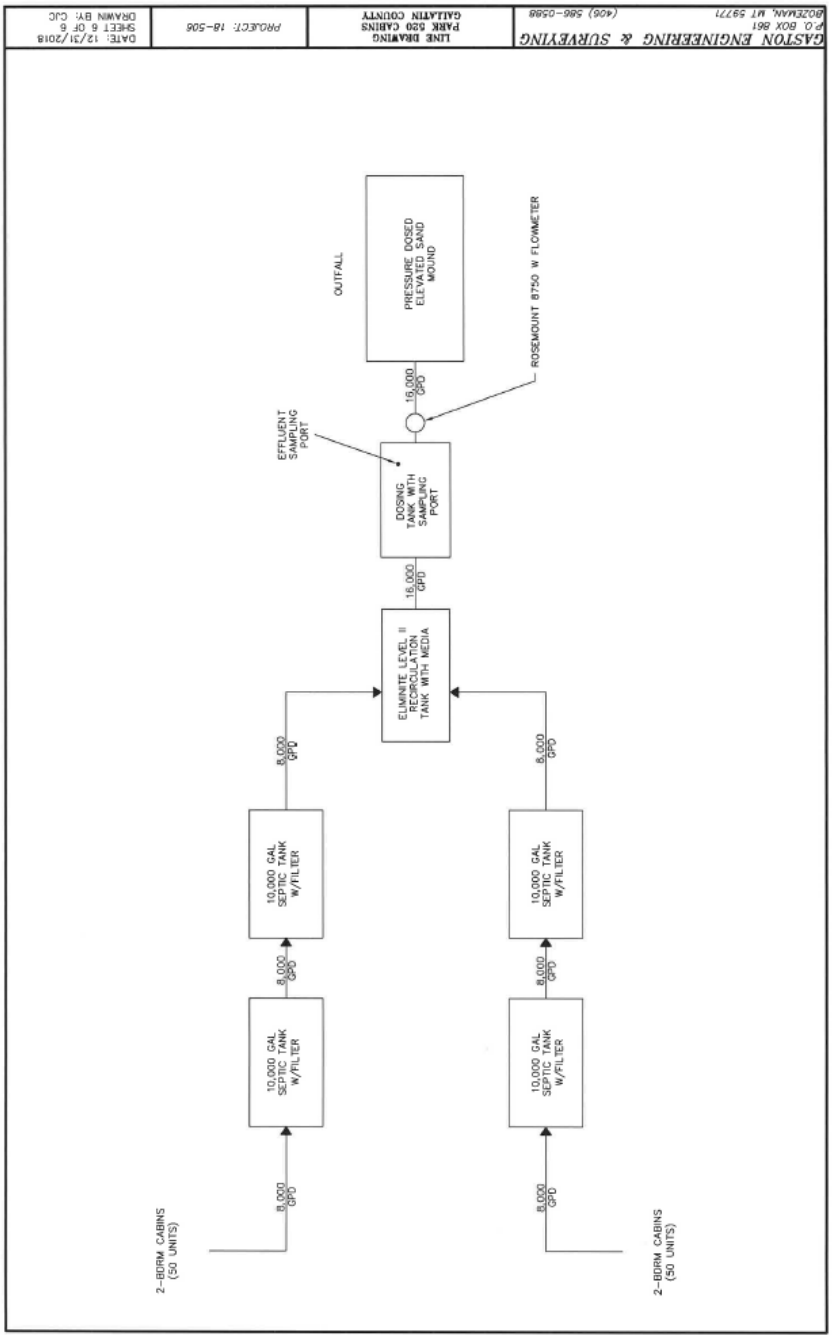


Figure 4. Wastewater Treatment System Line Diagram.

2.3 EFFLUENT CHARACTERISTICS

DEQ requires a permit applicant to disclose the quality of the effluent so that DEQ may evaluate the potential for pollution of state water. The applicant provided estimated effluent quality based on best professional judgement and effluent characteristics from equivalent facilities. These data are summarized below in **Table 2**. The majority of the concentrations are reported in units of milligrams per liter (mg/L), which is equivalent to one part per million.

Table 2. Estimated Effluent Quality Outfall 001

Estimated Effluent Quality – Outfall 001. Park 520 Hotel				
Parameter	**Location**	**Units**	**Estimated Value**	**Source of Data**
Flow rate, Discharge	FM-001	gpd	16000	APP
Nitrogen, Total (1) (as N)	EFF-001	mg/L	24	APP
Footnotes: APP = Application Form GW-2 and supplemental materials. EFF-001: Effluent sample site located at dose tank prior to drainfield. FM-001 = Effluent flow meter located after dose tank prior to drainfield. (1) Best professional estimate (application Form GW-1 Section M).				

2.4 GEOLOGY

The Park 520 Hotel site is located in volcanic tuff deposits related to the volcanic origins of the Yellowstone Park caldera. The tuff deposits are contained in the two members of the Huckleberry Ridge Tuff deposits. The upper member is a nonwelded pink and poorly compacted tuff with pumice fragments. The lower member of the Huckleberry Ridge Tuff is dark-gray welded tuff. The base of this unit is a phenocrystic, rhyolitic vitrophyre.

The well log for GWIC well Id #299682 located on this site, indicates the presence of the Huckleberry Ridge Tuff to at least 108 feet. There is approximately thirty feet of poorly sorted (Pleistocene) glacial outwash, volcanic sands and young (Holocene) alluvial fan deposits overlying the upper Huckleberry Ridge Tuff deposits.

2.5 HYDROGEOLOGY

The applicant provided hydrogeologic information for the site. A summary of that information is contained in **Table 3**. The water bearing unit for GWIC #699682 is the Huckleberry Tuff. Static water level is 65 feet below ground surface. Hydraulic gradient and flow direction was determined using a three point analysis included in **Appendix B**. Investigation by the applicant confirmed the existence of a groundwater gradient divide in the vicinity of the Park 520 Hotel site. The hydraulic gradient on this site is south east and quickly swings to the south west when moving west from the site. This gradient divide is likely an expression of paleo erosional surfaces in the Huckleberry formation and the underlying basaltic flows below the site.
Important hydrogeologic characteristics are summarized in **Table 3**.

Table 3. Hydrogeologic Summary

Average depth to ground water	80 feet
General ground water flow direction	S 46°E
Hydraulic conductivity	221 feet per day
Hydraulic gradient	0.009 feet/feet
Nearest downgradient surface water	Duck Creek (3534 feet, South 11°East)

2.6 GROUND WATER MONITORING WELLS

There are two monitoring wells associated with this permit: MW-1 and MW-2. Both of these wells are plotted in **Figure 3** and **Figure 5**. Monitoring well construction details are provided in **Table 4**. MW-1 is an upgradient monitoring well used to characterize the receiving water for outfall 001 and to monitor any changes to it. MW-2 is located in the mixing zone (300 feet downgradient) and will provide downgradient information. Driller's logs for each monitoring well are attached as **Appendix A**.

Table 4. Monitoring Well Summary

Monitoring Well MW-1	
MBMG GWIC ID:	299690
Location- latitude/longitude:	Latitude: 44.790861° Longitude: -111.113029°
Location- narrative:	Northwest corner of parcel, 30 feet northwest of PWS well
Rationale:	Ambient receiving water quality, Upgradient
Depth; screened interval:	Total depth of 125 feet, screened from 105-125 feet.
Notes:	Monitoring for upgradient ambient
Monitoring Well MW-2	
MBMG GWIC ID:	299689
Location- latitude/longitude:	Latitude: 47.7898833° Longitude: -111.111704°
Location- narrative:	Near southeast corner of site
Rationale:	Downgradient water quality, in mixing zone
Depth; screened interval:	Total depth of 147 feet, screened from 127-147 feet.
Notes:	Monitoring in mixing zone 300 feet downgradient from outfall 001

If a DEQ-approved monitoring well is abandoned, destroyed or decommissioned, or is no longer able to be sampled due to fluctuations in the ground water table, the permittee must install or designate a new well to replace the abandoned, destroyed, decommissioned, or non-viable well.

Figure 5. Monitoring Well Locations

2.7 GROUND WATER QUALITY CHARACTERISTICS

Water sampling results from MW-1 are provided below in **Table 5**. Based on the 189 microsiemens per centimeter (µS/cm) specific conductance, the receiving water is Class I ground water. Data reported in the table is taken from application material, form GW1, and additional sampling analysis provided by applicant.

Table 5. Ambient Water Quality Reported From Monitoring Well MW-1

MW-1 represents shallow ground water 120 feet upgradient of Outfall 001					
Parameter	**Units**	**Reported values**			**# of Samples**
		Minimum	**Maximum**	**Average**	
Chloride (as Cl)	mg/L	4	4	4	1
Total dissolved solids	mg/L	127	127	127	1
**Escherichia coli* bacteria	CFU/100mL	<1	<1	<1	1
*Nitrogen, nitrate+nitrite (as N)	mg/L	1.77	1.77	1.77	1
Nitrogen, total Kjeldahl (as N)	mg/L	ND	ND	ND	1
Organic carbon	mg/L	ND	ND	ND	1
pH	Standard units	7.6	7.6	7.6	1
*Specific conductivity (@25°C)	µS/cm	189	189	189	1
Static water level	Feet below ground surface	90	90	90	1
Total Nitrogen = Nitrate + Nitrite + Total Kjeldahl Nitrogen (as N).	Calculated, mg/L	1.77	1.77	1.77	1
*Data from 5/22/18 sample analysis					

3.0 WATER QUALITY STANDARDS AND NONDEGRADATION

Part of DEQ's mission is to protect, sustain, and improve the quality of state waters. Water quality standards provide the basis for effluent limits that DEQ applies to discharge permits (**Section 5**). These standards include three components: designated uses, water quality criteria, and nondegradation policy. DEQ protects all designated uses of state water by basing effluent limits on the most restrictive water quality limitations, intended to protect the most sensitive uses.

3.1 DESIGNATED USES

With a specific conductivity of 189 µS/cm (**Table 5** above), the receiving water is Class I ground water and therefore a high-quality water of the State. Class I ground waters must be maintained suitable for the following uses with little or no treatment:

- Public and private drinking water supplies
- Culinary and food processing purposes
- Irrigation
- Drinking water for livestock and wildlife
- Commercial and industrial purposes

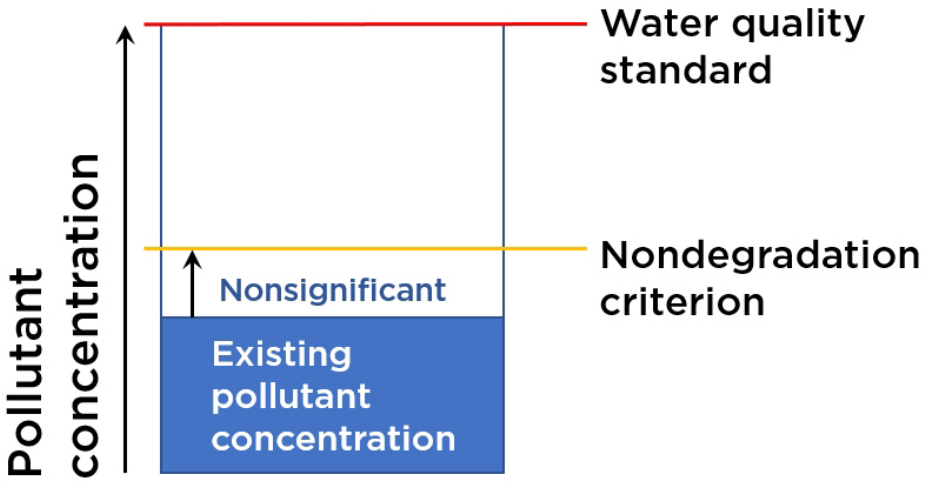
DEQ protects all the assigned beneficial uses by protecting the most sensitive. Drinking water is the most sensitive use of this receiving water.

3.2 Water Quality Criteria

Montana has water quality standards for both surface water and ground water. The numeric criteria for each are different because they must support different uses. DEQ writes permits to protect the most sensitive, thereby protecting all uses. DEQ's ground water standard for nitrate is 10.0 mg/L, as is the standard for nitrate + nitrite (as nitrogen). Class I ground water must be maintained suitable for use as a drinking water supply with little or no treatment, and therefore must meet the corresponding human health standard of 10.0 mg/L total nitrogen. These water quality standards may not be exceeded outside a designated mixing zone (**Section 4**).

3.3 Nondegradation

Montana's nondegradation policy is intended to preserve the existing condition of high-quality state waters. Any water whose existing condition is better than the water quality standards must be maintained in that high quality. Nondegradation policy allows discharges to cause only nonsignificant changes in water quality. Changes in water quality that are deemed significant require an authorization to degrade. An authorization to degrade is not an authorization to pollute; the water quality standard must not be exceeded.



DEQ must determine whether the proposed discharge will result in significant changes in water quality.

3.4 Nonsignificance

The proposed activity is a new source resulting in a change of existing water quality. DEQ must determine whether these water quality changes are significant. Some nonsignificant activities are specified in the Administrative Rules of Montana; other activities are evaluated for significance according to a process provided in the Rules. DEQ evaluated the significance of this discharge using the criteria and methods described below.

3.4.1 Ground Water Nonsignificance Criteria

For this discharge to ground water, the following nonsignificance criteria are relevant:

Nitrogen

Under Montana statute, ground water total nitrogen at or below 7.5 mg/L at the downgradient end of the mixing zone (see **Section 4**) is a nonsignificant change in water quality, so long as the discharge does not cause degradation of surface water. Evaluation of the effects to surface water are discussed in **Section 3.4.2**. Using the nonsignificance criterion of 7.5 mg/L, DEQ established effluent limits that cause the discharge to comply with ground water nonsignificance/nondegradation criteria at the end of the mixing zone. This is discussed in detail in **Section 5.1**.

Phosphorus

A total phosphorus surface water breakthrough time of greater than 50 years is a nonsignificant change in water quality. The phosphorus criterion requires an analysis to determine a breakthrough time. Breakthrough occurs when the subsurface soils lose their capability to adsorb any more phosphorus, and it reaches surface water.

Using these conservative estimates, DEQ's phosphorus breakthrough analysis estimates that phosphorus discharged to ground water from Outfall 001 may reach surface water in 68 years. Predicted phosphorus breakthrough within 50 years is considered significant. Therefore, in order to prevent degradation of downgradient surface water and to ensure that changes in water quality due to this discharge are nonsignificant, this permit includes an effluent limit to reduce the amount of phosphorus discharged. The phosphorus effluent limit is presented in **Section 5**.

Ground water discharges meeting these criteria are nonsignificant, so long as they do not cause degradation of surface waters (see **Section 3.4.2**).

3.4.2 Surface Water Nondegradation

The phosphorus breakthrough analysis is based upon distance and time to nearest surface water, inherently addressing the potential for degradation of surface water. Therefore, the analysis of reasonable potential for surface water degradation in this section is limited to nitrogen.

Ground water concentrations are calculated using the mixing zone equation (**Section 4**).

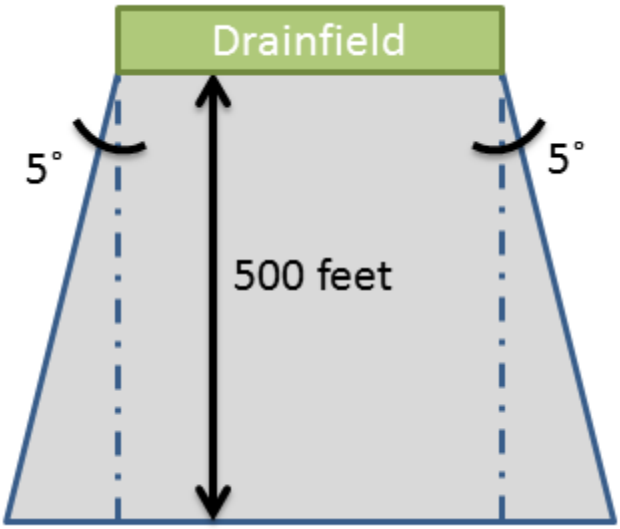
By using recent ground water nitrogen concentrations to identify the available assimilative capacity in the receiving aquifer, DEQ accounts for cumulative impacts of multiple nitrogen sources. These projections may be reanalyzed during every permit renewal cycle to incorporate updated site-specific information, which may include new upgradient or downgradient sources of nitrate.

The calculations underlying these projections are discussed and provided in full in **Appendix C**. These projections demonstrate that nitrate in ground water will not result in degradation of the nearest surface water. Therefore, water quality changes that result from discharges in compliance with this permit are nonsignificant.

4.0 MIXING ZONE

DEQ authorizes a standard mixing zone for total nitrogen discharged from Outfall 001. A mixing zone is a specifically defined area of the receiving water where water quality standards may be exceeded. DEQ evaluates the suitability according to criteria established in the Administrative Rules of Montana. The mixing zone is then defined in the permit. The applicant requested a standard mixing zone for this discharge.

A standard mixing zone extends 500 feet downgradient from the source. The upgradient boundary is equal to the width of the source (measured perpendicular to the of ground water flow direction). The mixing zone widens in the downgradient direction by 5° on either side. The width of the downgradient boundary is calculated by adding the increased width for each side (the tangent of 5° (0.0875) times the mixing zone length) to the width of the upgradient boundary. Standard mixing zones extend 15 feet below the ground water table.



The volume of ground water (Q_{GW}) available to mix with the effluent is calculated using Darcy's Equation: $Q_{GW} = KIA$

Where:
Q_{GW} = ground water flow volume (feet^3/day)
K = hydraulic conductivity (feet/day)
I = hydraulic gradient (feet/feet)
A = cross-sectional area (feet^2) at the downgradient boundary of the mixing zone.

Table 6 summarizes the variables used in Darcy's equation and the resulting volume of ground water available to mix at Outfall 001. These values have been provided by the applicant.

Table 6. Standard Mixing Zone for Total Nitrogen Discharged from Outfall 001

Parameter	Units	Value
Receiving water nitrogen concentration	1.77	mg/L
Ground water flow direction	S46E	Bearing
Length of mixing zone	500	Feet
Thickness/depth of mixing zone	15	Feet
Upgradient width of mixing zone	177	Feet
Downgradient width of mixing zone	264	Feet
Cross-sectional area of mixing zone (A)	3,962	Square feet
Hydraulic conductivity (K)	221	Feet per day
Hydraulic gradient (I)	0.009	Feet per feet
Volume of ground water available for mixing (Q_{GW})	7880	Cubic feet per day

In order to determine whether a mixing zone is allowable, DEQ calculates a predicted concentration at the downgradient end of the mixing zone. This mixing calculation follows the following procedure:

- Volume of ground water times the concentration of the parameter = existing load;
- Volume of discharge times the concentration of the parameter = waste load; and
- (Existing load + waste load) / total volume = predicted concentration.

Because the predicted concentration must satisfy the most stringent nonsignificance criterion (**Section 3**), DEQ can calculate water quality based effluent limits (WQBELs) by rearranging the equation and solving for the effluent concentration (**Section 5**).

5.0 PERMIT CONDITIONS

Discharge permits include conditions that ensure compliance with the Montana Water Quality Act and the regulations used to implement it. These conditions include effluent limits as well as any special conditions that DEQ deems necessary to protect the quality of the receiving water.

Montana's numeric water quality standards are published in Circular DEQ-7. Water quality criteria applicable to this permit are summarized below in **Table 7**. The permit establishes effluent limits that will meet water quality standards and nondegradation criteria, thereby protecting beneficial uses and existing high quality waters. The most restrictive criteria in **Table 7** provide the basis for the effluent limits.

Table 7. Applicable Ground Water Quality Criteria

Parameter	Human Health Standard	Beneficial Use Support	Nondegradation Criteria
Nitrate plus nitrite (as Nitrogen[N])	10 mg/L	-	-
Total Nitrogen	-	10 mg/L	**7.5 mg/L**
Total Phosphorus	-	-	**>50 year breakthrough**

This discharge permit includes numeric WQBELs that restrict the strength and volume of the discharge. The ground water nonsignificance criteria (**Section 3.4.1**) provide the basis for the limits. DEQ calculates WQBELs by rearranging the mixing zone equation (**Section 4**) and solving for the effluent concentration that satisfies the water quality criteria. DEQ evaluates and recalculates the limits using updated water quality data as part of every permit renewal cycle. In this way, DEQ protects the receiving water quality by continually assessing cumulative impacts to the receiving water.

5.1 TOTAL NITROGEN EFFLUENT LIMIT

The nonsignificance criterion of 7.5 mg/L is the most restrictive of the water quality criteria applicable to this permit; therefore it is the water quality target for this effluent limit. DEQ established the final WQBEL for this discharge by back-calculating the effluent concentration that results in 7.5 mg/L at the end of the mixing zone, given the available dilution. Available dilution is determined by recent ground water quality sampling of the receiving water. Ambient total nitrogen averaged 1.77 mg/L (**Section 2**). DEQ calculates an effluent limit that protects receiving water quality and beneficial uses according to the following equation:

$$\underline{\text{Equation 1:}}\ C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:

C_{lmt} = effluent limitation concentration
C_{std} = limiting water quality criterion
C_{gw} = ambient receiving ground water concentration
D = dilution ratio (Q_{gw} / Q_{eff})

Q_{gw} =ground water flux at the end of the mixing zone
Q_{eff} = average maximum daily discharge

Using the values provided above in **Table 6**, the result for C_{lmt} is 28.6 mg/L. This is the final WQBEL expressed as a concentration. Load limits are more appropriate for discharges to ground water since the long-term loading is the greater concern in absence of aquatic life considerations. Additionally, load limits inherently control both the strength and volume of the discharge. A discharge of 16,000 gallons per day containing 28.6 mg/L total nitrogen is equivalent to 3.8 pounds per day. The limit calculations are provided in detail in **Appendix D**.

5.2 TOTAL PHOSPHORUS EFFLUENT LIMIT

DEQ determined that phosphorous discharged to ground water would reach the surface water Duck Creek in 68.5 years. A phosphorous breakthrough time of less than 50 years is considered significant.

Based on the information and analyses presented above, DEQ proposes the following numerical effluent limitations in **Table 8** below.

Table 8. Effluent Limits

Proposed Final Effluent Limits – Outfall 001, Park 520 Hotel, MTX000248		
Parameter	**Units**	**Effluent Limitations, Daily Max**
Total Nitrogen (as N)	lbs/day	3.8
Footnotes: Beneficial Uses: ARM 17.30.1006 (1) See definition in Part V of permit.		

5.3 SPECIAL CONDITIONS

There are no special conditions associated with this permit.

6.0 MONITORING AND REPORTING REQUIREMENTS

DEQ requires effluent and ground water monitoring to assure compliance with the effluent limitations and therefore water quality standards. Effluent monitoring and ground water monitoring is required as a condition of this permit. All monitoring and sampling required by this permit must be representative; therefore the permit identifies specific monitoring locations. Monitoring requirements and rationale are summarized below.

6.1 EFFLUENT MONITORING

This permit includes numeric effluent limitations with specific magnitudes and durations to ensure the discharge will not cause or contribute to an exceedance of an applicable water quality standard (see **Section 3**).

Accordingly, the permittee is required to monitor and report at a specified frequency in order to demonstrate compliance with these limitations.

Effluent samples and discharge flow measurements must be representative of the nature and volume of the effluent. The effluent sample location (EFF-001) is located at dose tank prior to discharge as shown in **Figure 3**. The permittee is required to install, maintain and report flow measurements using a flow-measuring device capable of measurements that are within 10 percent of the actual flow. The flow measuring device (FM-001) is located after dose tank prior to drainfield (**Figure 3**). The flow measuring device must be installed and in operating condition prior to discharge.

Effluent monitoring and reporting requirements are summarized in **Table 9** below. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 9. Effluent Monitoring and Reporting Requirements

Effluent Monitoring and Reporting Requirements – Outfall 001

Analyte/Measurement/ Method	Monitor Location	Units	Sample Type(1)	Minimum Sample Frequency	Reporting Requirements(1)(2)	Report Freq
Count of Daily Samples Collected During Reporting Period	EFF-001	-	-	-	Count	Quarterly
Flow Rate, Effluent(3)	FM-001	gpd	Contin-uous	Contin-uous	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Nitrite+Nitrate (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	EFF-001	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total (as N)(4)	EFF-001	mg/L	Calculate	1/Quarter	Daily Maximum Quarterly Average	Quarterly
		lbs/day(5)	Calculate	1/Quarter	Daily Maximum(6) Quarterly Average(7)	Quarterly
Phosphorus, Total (as P)	EFF-001	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
		lbs/day(5)	Calculate	1/Quarter	Quarterly Average(7)	Quarterly

Footnotes:
EFF-001: Description provided in Table 2
FM-001: Description provided in Table 2
If no discharge occurs during the reporting period, "no discharge" shall be recorded on the effluent Discharge Monitoring Report (DMR) report forms.
Grab sample will represent concentration for a 24 hour period.
Parameter analytical methods shall be in accordance with the Code of Federal Regulations, 40 CFR Part 136, unless specified above.

(1) See definitions in Part V of the permit.
(2) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR) form.
(3) Requires recording device or totalizing meter, must be capable of recording daily effluent volume.
(4) Total Nitrogen is the sum of Nitrate + Nitrite and Total Kjeldahl Nitrogen.
(5) Load calculation: lbs/day = (mg/L) x flow (gpd) x [8.34 x 10^{-6}].
(6) Daily Maximum Load calculation: lbs/day = the maximum of all calculated individual daily average loads (lbs/day) recorded during the reporting period.
(7) Quarterly Average Load calculation: lbs/day = the average of all calculated individual daily average loads (lbs/day) recorded during the reporting period.

6.2 GROUND WATER MONITORING

As a condition, this permit requires ground water monitoring to provide long term ambient and downgradient characterization of the aquifer. Ground water monitoring will be required at monitoring wells MW-1, and MW-2. Data collected via ground water monitoring will be used for mixing zone evaluation and aquifer characterization in future permit renewals. Ground water monitoring and reporting requirements are summarized in the table below. Sampling and reporting requirements shall commence upon the effective date of the permit.

Ground water monitoring and reporting requirements are summarized in **Table 10** and **Table 11**. All analytical methods must be in accordance with the Code of Federal Regulations, 40 CFR Part 136 for each monitored parameter.

Table 10. Sampling of MW-1 shall begin upon the effective date of this permit.

Upgradient Ground Water Monitoring and Reporting Requirements						
Analyte/Measurement	**Monitor Location**(1)	**Units**	**Sample Type**(2)	**Minimum Sampling Frequency**	**Reporting**(2)(3)(4) **Requirements**	**Reporting Frequency**
Chloride (as Cl)	MW-1	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Count of Daily Samples Collected During Reporting Period	MW-1	-	-	-	Count	Quarterly
Escherichia coli Bacteria	MW-1	CFU/100ml	Grab	1/Quarter	Daily Maximum Quarterly Average(5)	Quarterly
Nitrogen, Nitrate + Nitrite (as N)	MW-1	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	MW-1	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	MW-1	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
pH	MW-1	s.u.	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-1	µS/cm	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)(6)	MW-1	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Temperature	MW-1	°C	Instant-aneous	1/Quarter	Quarterly Average	Quarterly

(1) Refer to Section 2.2 and Section 2.6 of the Fact Sheet for the existing or proposed location of the monitoring wells.

(2) See definitions in Part V of the permit.

(3) Submittal of DMRs will be required, regardless of the installation status of each individual monitoring well. If the monitoring well(s) is not installed for an individual monitoring period, the following shall be stated upon each applicable DMR: "monitoring well has not been installed".

(4) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(5) The geometric mean must be reported if more than one sample is taken during a reporting period.

(6) Measuring point (point of reference) for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.

Table 11. Sampling of MW-2 shall begin upon the effective date of this permit.

Down gradient Ground Water Monitoring and Reporting Requirements						
Analyte/Measurement	**Monitor Location**[1]	**Units**	**Sample Type**[2]	**Minimum Sampling Frequency**	**Reporting**[2][3][4] **Requirements**	**Reporting Frequency**
Chloride (as Cl)	MW-2	mg/L	Grab	1/Quarter	Quarterly Average	Quarterly
Count of Daily Samples Collected During Reporting Period	MW-2	-	-	-	Count	Quarterly
Escherichia coli Bacteria	MW-2	CFU/100ml	Grab	1/Quarter	Daily Maximum Quarterly Average[5]	Quarterly
Nitrogen, Nitrate + Nitrite (as N)	MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Ammonia (as N)	MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
Nitrogen, Total Kjeldahl (TKN)(as N)	MW-2	mg/L	Grab	1/Quarter	Daily Maximum Quarterly Average	Quarterly
pH	MW-2	s.u.	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Specific Conductivity @ 25°C	MW-2	µS/cm	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Static Water Level (SWL)[6]	MW-2	ft-bmp	Instant-aneous	1/Quarter	Quarterly Average	Quarterly
Temperature	MW-2	°C	Instant-aneous	1/Quarter	Quarterly Average	Quarterly

(1) Refer to Section 2.2 and Section 2.6 of the Fact Sheet for the existing or proposed location of the monitoring wells.

(2) See definitions in Part V of the permit.

(3) Submittal of DMRs will be required, regardless of the installation status of each individual monitoring well. If the monitoring well(s) is not installed for an individual monitoring period, the following shall be stated upon each applicable DMR: "monitoring well has not been installed".

(4) Daily Maximum: Report highest measured daily value for the reporting period on Discharge Monitoring Report (DMR).

(5) The geometric mean must be reported if more than one sample is taken during a reporting period.

(6) Measuring point (point of reference) for SWL measurements shall be from top of casing and measured to within 1/100th of one foot.

PUBLIC NOTICE

Legal notice information for water quality discharge permits are listed at the following website: http://deq.mt.gov/Public/notices/wqnotices. Public comments on this proposal are invited any time prior to close of business on **July 3, 2019**. Comments may be directed to:

DEQWPBPublicComments@mt.gov

or to:

Montana Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620

All comments received or postmarked prior to the close of the public comment period will be considered in the formulation of the final permit. DEQ will respond to all substantive comments pertinent to this permitting action and may issue a final decision within thirty days of the close of the public comment period.

All persons, including the applicant, who believe any condition of the draft permit is inappropriate, or that DEQ's tentative decision to deny an application, terminate a permit, or prepare a draft permit is inappropriate, shall raise all reasonably ascertainable issues and submit all reasonably available arguments supporting their position by the close of the public comment period (including any public hearing). All public comments received for this draft permit will be included in the administrative record and will be available for public viewing during normal business hours.

Copies of the public notice are mailed to the applicant, state and federal agencies, and interested persons who have expressed interest in being notified of permit actions. A copy of the distribution list is available in the administrative record for this draft permit. Electronic copies of the public notice, draft permit, fact sheet, and draft environmental assessment are available at the following website: http://deq.mt.gov/Public/notices/wqnotices.

Any person interested in being placed on the mailing list for information regarding this permit may contact the DEQ Water Protection Bureau at (406) 444-5546 or email DEQWPBPublicComments@mt.gov. All inquiries will need to reference the permit number (MTX000248), and include the following information: name, address, and phone number.

During the public comment period provided by the notice, DEQ will accept requests for a public hearing. A request for a public hearing must be in writing and must state the nature of the issue proposed to be raised in the hearing.

APPENDIX A – MONITORING WELL LOGS

Monitoring Well MW-1:

MONTANA WELL LOG REPORT

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Site Name: PARK 520 HOTEL LLC
GWIC Id: 299690

Section 1: Well Owner(s)
1) PARK 520 HOTEL LLC (MAIL)
PO BOX 345
WEST YELLOWSTONE MT 59758 [11/01/2018]
2) PARK 520 HOTEL LLC (WELL)
155 E NOS LOOP
WEST YELLOWSTONE MT 59758 [11/01/2018]

Section 2: Location

Township	Range	Section	Quarter Sections
12S	05E	19	NW¼ SW¼ NW¼

County	Geocode
GALLATIN	30 0008 19 2 01 03 0000

Latitude	Longitude	Geomethod	Datum
44.79085	-111.11295	NAV-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum Date

Addition | Block | Lot

Section 3: Proposed Use of Water
MONITORING (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, November 01, 2018

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	57	7.3
57	125	5

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
2	57	6.3	0.25		WELDED	A53B STEEL
45	105	4		220.0	SPLINE	PVC SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
105	125	4	0024	020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Feet?
0	0	CASING SEAL	Y

Section 7: Well Test Data

Total Depth: 125
Static Water Level: 59
Water Temperature:

Air Test: *

4 gpm with drill stem set at 124 feet for 1 hours.
Time of recovery 1 hours
Recovery water level 80 feet.
Pumping water level feet.

* *During the well test the discharge rate shall be as uniform as possible. This rule may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
MONITOR WELL 3

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	5	TOP SOIL
5	12	VOLCANIC SANDS & MEDIUM GRAVELS
12	18	GRAY VOLCANIC SANDS
18	65	VOLCANIC SANDS, MEDIUM SHARP GRAVELS, & BOULDERS
65	105	GRAY BASALT
105	125	GRAY & BLACK BASALT W/ 3 GPM WATER

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TROY HAUSER
Company: RED TIGER DRILLING
License No: WWC-365
Date Completed: 11/1/2018

Monitoring Well MW-2:

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: PARK 520 HOTEL LLC
GWIC Id: 299682

Section 1: Well Owner(s)
1) PARK 520 HOTEL LLC (MAIL)
PO BOX 345
WEST YELLOWSTONE MT 59758 [10/31/2018]
2) PARK 520 HOTEL LLC (WELL)
155 EINOS LOOP
WEST YELLOWSTONE MT 59758 [10/31/2018]

Section 2: Location

Township	Range	Section	Quarter Sections
12S	05E	15	NW¼ SW¼ NW¼

County	Geocode
GALLATIN	06-0086-15-2-01-06-0000

Latitude	Longitude	Geomethod	Datum
44.789883	-111.113033	NAV-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
MONITORING (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Wednesday, October 31, 2018

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	104	7.3
104	124	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	104	6.0	0.25		WELDED	A53B STEEL
94	104	4		220.0	SPLINE	PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
104	124	4	3024	.020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	CASING SEAL	Y

Section 7: Well Test Data

Total Depth: 124
Static Water Level: 65
Water Temperature:

Air Test *

30 gpm with drill stem set at 122 feet for 1 hours.
Time of recovery 1 hours.
Recovery water level 65 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
MONITOR WELL 1

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	4	TOP SOIL
4	10	BROWN CLAY W/VOLCANIC SANDS
10	31	VOLCANIC SANDS, MEDIUM GRAVELS, & BOULDERS
31	54	FRACTURED GRAY BASALT
54	67	GRAY & GREEN BASALT W/ YELLOW SPOTS
67	108	BASALT W/ RED CLAY
108	124	BLACK & GRAY BASALT W/30 GPM WATER

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TROY HAUSER
Company: RED TIGER DRILLING
License No: MWC-365
Date Completed: 10/31/2018

Reference Well for Gradient Calculation:

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View scanned well log (3/5/2008 1:45:20 PM)

Site Name: EVJE GARY
GWIC Id: 106695
DNRC Water Right: C001962-00

Section 1: Well Owner(s)
1) EVJE, GARY (MAIL)
P.O. BOX B
WEST YELLOWSTONE MT 59758 [08/22/1996]
2) GEIER, HANS (MAIL)
PO BOX 367
WEST YELLOWSTONE MT 59758 [09/12/1973]

Section 2: Location

Township	Range	Section	Quarter Sections
12S	05E	16	NW¼ NE¼ SE¼ NE¼

County: GALLATIN
Geocode:

Latitude	Longitude	Geomethod	Datum
44.7744	-111.1147	UNKNOWN	NAD27

Ground Surface Altitude	Ground Surface Method	Datum	Date
6690			

Measuring Point Altitude	MP Method	Datum	Date Applies
6690			8/22/1996

Addition	Block	Lot
BEARTRAP RANCH	1	2

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Wednesday, September 12, 1973

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	200	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
0	18	6				STEEL
10	200	4				PVC

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
140	200	4		1/4X2IN	SLOTS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	18	MUD	

Section 7: Well Test Data

Total Depth: 200
Static Water Level: 100
Water Temperature:

Air Test *

15 gpm with drill stem set at 190 feet for 3 hours.
Time of recovery _ hours.
Recovery water level _ feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
UNABLE TO ACCESS WELL. SAMPLE WAS TAKEN FROM OUTSIDE TAP LOCATED ON EAST SIDE OF HOUSE.

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	10	TOPSOIL AND BROKEN ROCK
10	200	RHYOLITE

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: LINDSAY DRILLING CO INC
License No: WWC-38
Date Completed: 9/12/1973

Reference Well for Gradient Calculation:

MONTANA WELL LOG REPORT

Other Options

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps
View field visits for this site
View scanned well log (3/5/2008 1:24:12 PM)

Site Name: WEAVER GARY
GWIC Id: 135303
DNRC Water Right: C089596

Section 1: Well Owner(s)
1) MAST/DALEY, CHRISTOPHER/AISLINN (MAIL)
70 COLTER LOOP DR
HELENA MT 59602-7757 [02/01/2016]
2) MAST/DALEY, CHRISTOPHER/AISLINN (WELL)
96 CHOKECHERRY LANE
WEST YELLOWSTONE MT 59758 [02/01/2016]
3) MULLER, WAND KIT C (MAIL)
PO BOX 2123
WEST YELLOWSTONE MT 59758 [01/01/2008]
4) MULLER, WARREN W AND KIT C (WELL)
96 CHOKECHERRY LANE
WEST YELLOWSTONE MT 59758 [01/01/2008]
5) WEAVER, GARY (MAIL)
96 CHOKECHERRY LANE
WEST YELLOWSTONE MT 59758 [05/05/1992]

Section 2: Location

Township	Range	Section	Quarter Sections
12S	05E	15	SW¼ SW¼ NE¼ NW¼

County: GALLATIN — Geocode:

Latitude	Longitude	Geomethod	Datum
44.7922	-111.1122	UNKNOWN	NAD27

Ground Surface Altitude	Ground Surface Method	Datum	Date
6740			

Measuring Point Altitude	MP Method	Datum	Date Applies
6740			7/25/1997

Addition	Block	Lot
ASPEN HILLS		20

Section 3: Proposed Use of Water
DOMESTIC (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Tuesday, September 08, 1992

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	240	6

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
2.5	22.5	6			WELDED	STEEL
8	240	4.5		160.00	WELDED	PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
220	240	4.5		0.020	FACTORY SLOTTED

Section 7: Well Test Data

Total Depth: 240
Static Water Level: 145
Water Temperature: 7.7 °C

Air Test *

30 gpm with drill stem set at 240 feet for 1 hours.
Time of recovery 0.25 hours.
Recovery water level 145 feet.
Pumping water level 180 feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
TEMP - 46 DEGREES F; SC – 168 UMHOS

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	11	SANDY TOPSOIL & GRAVELS
11	240	GRAY TO YELLOW VOLCANIC (VERY POROUS & FRACTURED)

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name:
Company: POTTS DRILLING INC
License No: WWC-512
Date Completed: 9/8/1992

Reference Well for Gradient Calculation:

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: PARK 520 HOTEL LLC
GWIC Id: 299689

Section 1: Well Owner(s)
1) PARK 520 HOTEL LLC (MAIL)
PO BOX 345
WEST YELLOWSTONE MT 59758 [11/01/2018]
2) PARK 520 HOTEL LLC (WELL)
155 EINOS LOOP
WEST YELLOWSTONE MT 59758 [11/01/2018]
3) PARK 520 HOTEL LLC (WELL)
155 EINOS LOOP
WEST YELLOWSTONE MT 59758 [11/01/2018]

Section 2: Location

Township	Range	Section	Quarter Sections
12S	05E	15	SW¼ SW¼ NW¼

County	Geocode
GALLATIN	06-0068-15-2-01-05-0000

Latitude	Longitude	Geomethod	Datum
44.789833	-111.11166	NAV-GPS	WGS84

Ground Surface Altitude	Ground Surface Method	Datum	Date

Addition	Block	Lot

Section 3: Proposed Use of Water
MONITORING (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Thursday, November 01, 2018

Section 6: Well Construction Details
Borehole dimensions

From	To	Diameter
0	40	7.3
40	147	6

Casing

From	To	Diameter	Well Thickness	Pressure Rating	Joint	Type
-2	40	6.8	0.25		WELDED	A538 STEEL
27	127	4		220.0	SPLINE	PVC-SCHED 40

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
127	147	4	3024	.020	FACTORY SLOTTED

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	0	CASING SEAL	Y

Section 7: Well Test Data

Total Depth: 147
Static Water Level: 87
Water Temperature:

Air Test *

10 gpm with drill stem set at 140 feet for 1 hours.
Time of recovery 12 hours.
Recovery water level 87 feet.
Pumping water level _ feet.

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks
MONITOR WELL 2

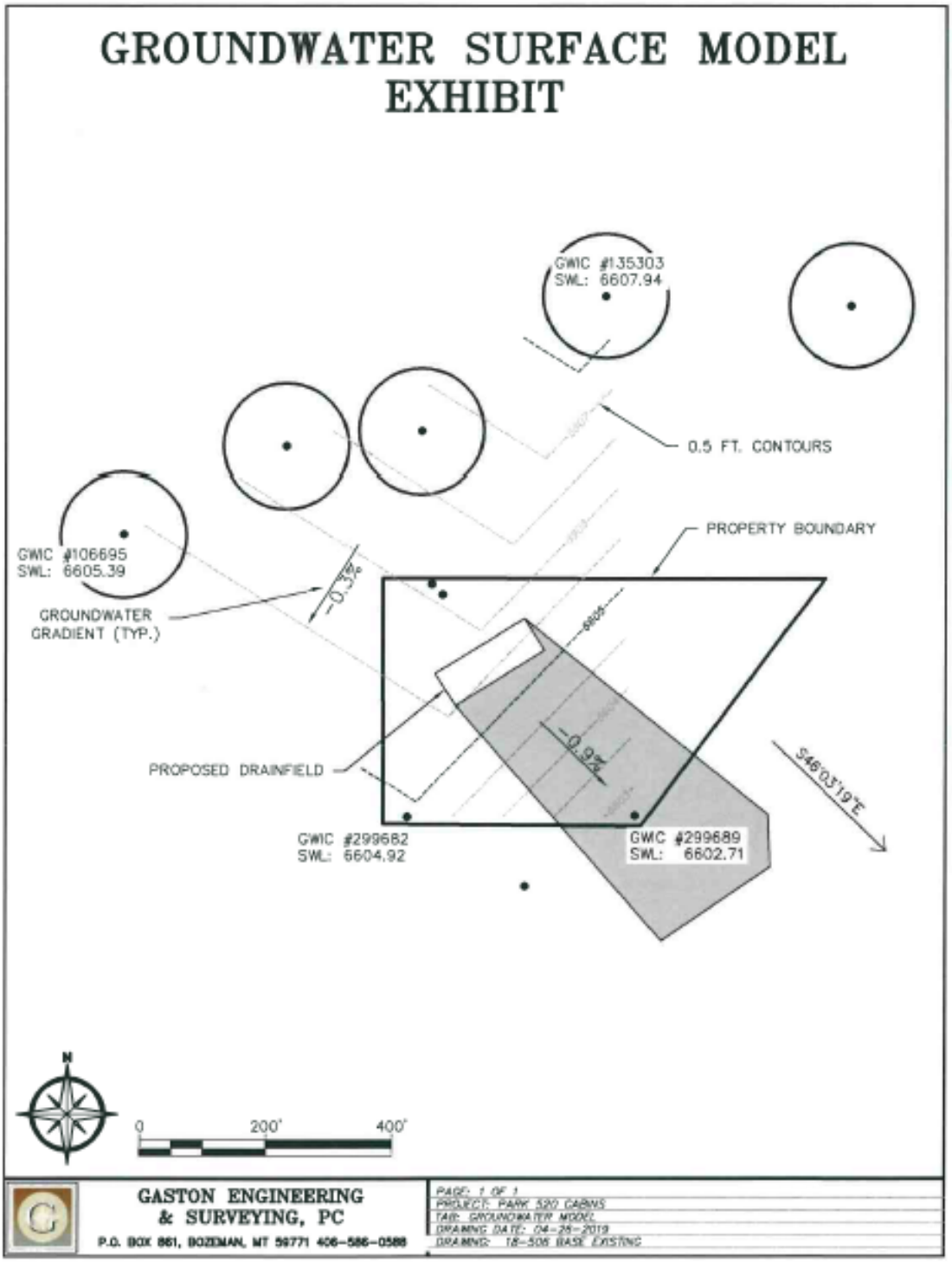
Section 9: Well Log
Geologic Source
Unassigned

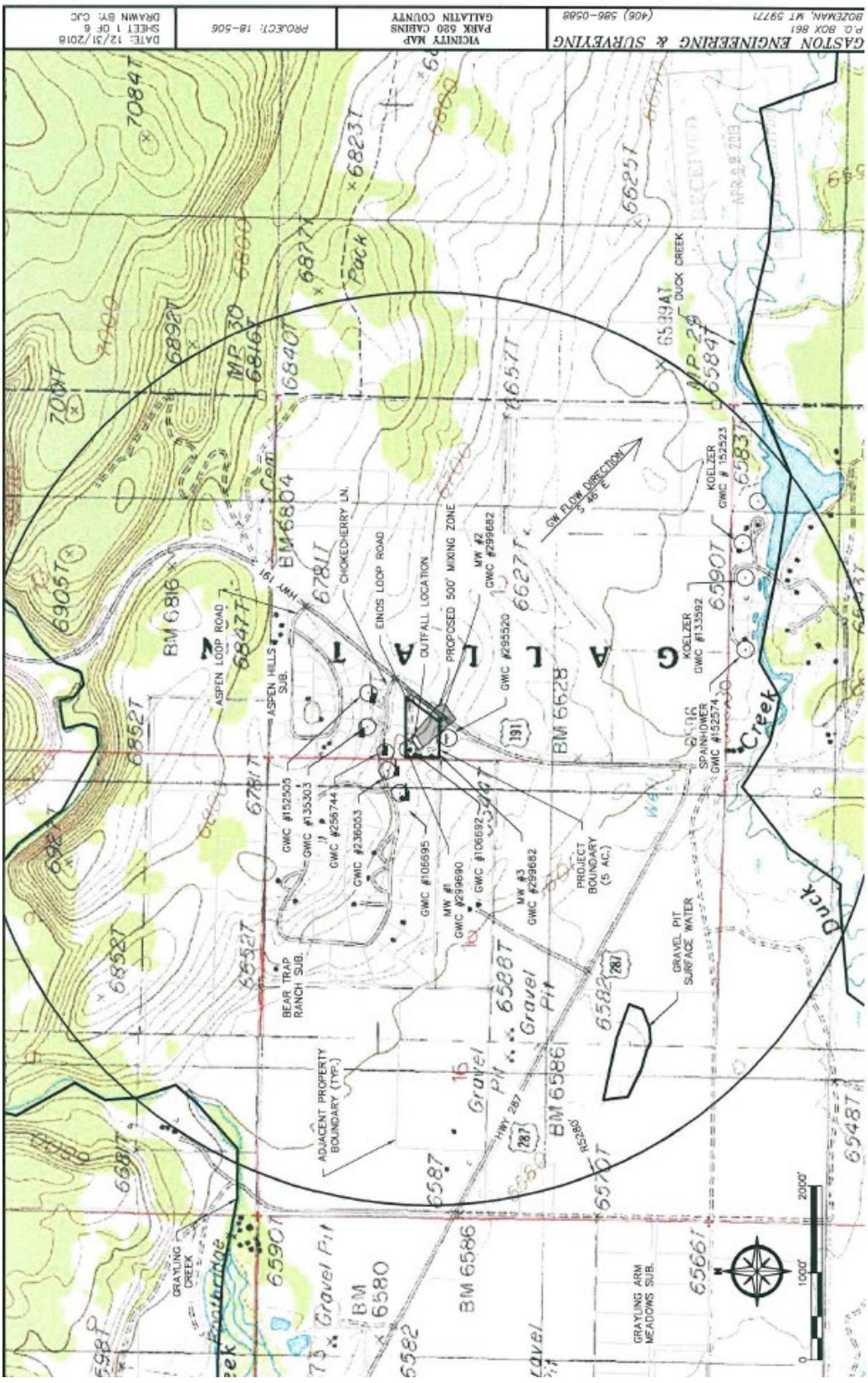
From	To	Description
0	5	TOP SOIL
5	14	VOLCANIC SANDS & SMALL GRAVELS
14	20	BROWN SILTSAND
20	37	VOLCANIC SANDS & SMALL GRAVELS
37	147	FRACTURED BROWN & BLACK BASALT WI 2 GPM WATER @ 130' & 8 GPM WATER @ 145'

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: TROY HAUSER
Company: RED TIGER DRILLING
License No: MWC-365
Date Completed: 11/1/2018

APPENDIX B- Hydraulic Gradient Analysis Figures




GASTON ENGINEERING & SURVEYING
P.O. BOX 861
BOZEMAN, MT 59771
(406) 586-0588
VICINITY MAP
PARK 520 CABINS
GALLATIN COUNTY
PROJECT: 18-506
DATE: 12/31/2018
SHEET 1 OF 6
DRAWN BY: CJC
GALLATIN
OUTFALL LOCATION
PROPOSED 500' MIXING ZONE
GW FLOW DIRECTION
CHOKECHERRY LN.
EINOS LOOP ROAD
ASPEN LOOP ROAD
ASPEN HILLS SUB.
BEAR TRAP RANCH SUB.
GRAYLING ARM MEADOWS SUB.
PROJECT BOUNDARY (5 AC.)
ADJACENT PROPERTY BOUNDARY (TYP.)
GRAVEL PIT SURFACE WATER
Gravel Pit
DUCK CREEK
GRAYLING CREEK
MW #1 GWIC #299690
MW #2 GWIC #299682
MW #3 GWIC #299682
GWIC #295520
GWIC #106595
GWIC #106592
GWIC #152505
GWIC #135303
GWIC #256744
GWIC #236053
KOELZER GWIC # 152523
KOELZER GWIC #133592
SPAINHOWER GWIC #152574
BM 6586
BM 6580
BM 6528
HWY 191
HWY 287
2000'
1000'
0

Hydraulic Gradient Three Point Solution Worksheet

Instructions to determine groundwater (GW) gradient and flow direction based on static water elevations (SWE) of 3 wells.

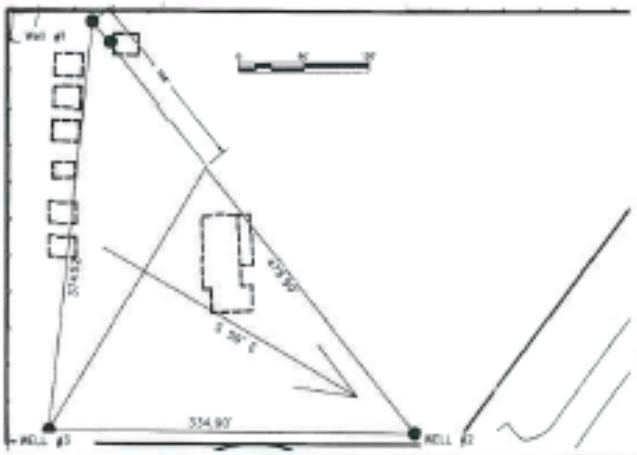
SITE NAME: _____

A. Record elevation difference and horizontal distances (HD) between the wells:

Well	Topographic Elevation (ft)		Depth to Static Water (ft bgs*)		SWE (ft)	Wells		HD (ft)
#1	6695.36	-	89.25	=	6606.11	#1 to #2	=	334.90
#2	6687.49	-	84.78	=	6602.71	#2 to #3	=	478.99
#3	6669.22	-	64.30	=	6604.92	#3 to #1	=	374.52

* bgs = below ground surface

B. Plot the well locations on a scaled diagram



SCALE: _____" = _____'
See Scale Bar

C. Perform the following calculations:

1. Calculate the position between the High Static Water Elevation (HSWE) well and the Low Static Water Elevation (LSWE) well where the SWE is the same as the Intermediate Static Water Elevation (ISWE).

   (a) HSWE 6606.11 minus LSWE 6602.71 = (a) 3.40 (ft)

   (b) Horizontal distance between HSWE well and LSWE well 478.99 divided by (a) 3.40 = (b) 140.88 (ft/ft)

   (c) HSWE 6606.11 minus ISWE 6604.92 = (c) 1.19 (ft)

   (d) (b) 140.88 x (c) 1.19 = (d) 167.65 (ft) (= the horizontal distance between the HSWE well and LSWE well that is equal to the ISWE).

2. Measure the distance (d) from the HSWE well along the line between it and the LSWE well, and plot that position on the diagram.
3. Draw a straight line from the ISWE well to position (d) on the well location diagram. This represents the water level contour line along which the SWE is the same as the ISWE well.
4. Draw a line perpendicular to the ISWE contour line through the HSWE well location on the well location diagram. This is the ground water flow direction (high to low). The distance along this groundwater flow line from the HSWE well to the ISWE contour line is (e).

D. Calculate the Hydraulic Gradient (HG) of the groundwater by dividing (c) by (e).

(c) 1.19 divided by (e) 152.30 = HG 0.008 (ft/ft)

APPENDIX C – NONSIGNIFICANCE PROJECTIONS:

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME:	**Park 520 Hotel- 50-year Breakthrough Limit = 8.8 lbs/yr**
COUNTY:	Gallatin
Permit #:	MTX000248
NOTES:	Variables used are based on conservative measurements
	Design Capacity = 16,000 gpd = 7,880 ft³/day

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	177	ft
L	Length of Primary Drainfield's Long Axis	167	ft
W	Width of Primary Drainfield's Short Axis	60	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	9	ft
D	Distance from Drainfield to Surface Water	3477	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils,	1.0	ft
Ne	1.0 ft for fine soils)**		
Sw	Soil Weight (usually constant)	100	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200	ppm
#I	Number of proposed wastewater treatment systems	80	
CONSTANTS			
PI	Phosphorous Load per proposed wastewater treatment system	8.8	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (PI)(#I)	704	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	9018000	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	167326279	lbs
P1	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	35269	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	50	years

BY: R. Morse
DATE: 5/10/19

NOTES: ** Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*

REV. 04/2000

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ)

PHOSPHOROUS BREAKTHROUGH ANALYSIS

SITE NAME:	**Park 520 Hotel Projected Breakthrough in Years = 68.5 Years**
COUNTY:	Gallatin
Permit #:	MTX000248
NOTES:	Variables used are based on conservative measurements
	Design Capacity = 16,000 gpd = 7,880 ft³/day

VARIABLES	DESCRIPTION	VALUE	UNITS
Lg	Length of Primary Drainfield as Measured Perpendicular to Ground Water Flow	177	ft
L	Length of Primary Drainfield's Long Axis	167	ft
W	Width of Primary Drainfield's Short Axis	60	ft
B	Depth to Limiting Layer from Bottom of Drainfield Laterals*	9	ft
D	Distance from Drainfield to Surface Water	3477	ft
T	Phosphorous Mixing Depth in Ground Water (0.5 ft for coarse soils, 1.0 ft for fine soils)**	1.0	ft
Ne			
Sw	Soil Weight (usually constant)	100	lb/ft3
Pa	Phosphorous Adsorption Capacity of Soil (usually constant)	200	ppm
#I	Number of proposed wastewater treatment systems	80	
CONSTANTS			
PI	Phosphorous Load per proposed wastewater treatment system	6.4	lbs/yr
X	Conversion Factor for ppm to percentage (constant)	1.0E+06	
EQUATIONS			
Pt	Total Phosphorous Load = (PI)(#I)	515	lbs/yr
W1	Soil Weight under Drainfield = (L)(W)(B)(Sw)	9018000	lbs
W2	Soil Weight from Drainfield to Surface Water = [(Lg)(D) + (0.0875)(D)(D)] (T)(Sw)	167326279	lbs
P1	Total Phosphorous Adsorption by Soils = (W1 + W2)[(Pa)/(X)]	35269	lbs
SOLUTION			
BT	**Breakthrough Time to Surface Water = P / Pt**	68.5	years

BY: R. Morse
DATE: 5/10/19

NOTES: ** Depth to limiting layer is typically based on depth to water in a test pit or bottom of a dry test pit minus two feet to account for burial depth of standard drainfield laterals.*

REV. 04/2000

APPENDIX D – EFFLUENT LIMIT CALCULATIONS

The system consists of Level 2, Eliminite Media-Trickling Filter System.

To protect beneficial uses [ARM 17.30.1006(1)(b)(ii)], there shall be no increase of a parameter to a level that renders the waters harmful, detrimental, or injurious to the beneficial uses. Therefore, no wastes may be discharged such that the waste either alone or in combination with other wastes will violate or can reasonably be expected to violate any standard. DEQ establishes the effluent limitations for nitrogen based on the projection that the entire nitrogen load in the wastewater stream may ultimately be converted to nitrate (USEPA, 2002a).

The allowable discharge concentrations are derived from a mass-balance equation (ARM 17.30.517) which is a simple steady-state model, used to determine concentration after accounting for other sources of pollution in the receiving water and any dilution as provided by a mixing zone. The mass-balance equation (Equation 1) derived for ground water is as follows:

Equation 1:

$$Q_{gw}C_{gw} + Q_{eff}C_{eff} = Q_{comb}C_{proj}$$

Where:

Q_{gw}	=	ground water available for mixing
C_{gw}	=	ambient receiving ground water concentration
Q_{eff}	=	maximum design capacity of wastewater system
C_{eff}	=	effluent pollutant concentration
Q_{comb}	=	combined ground water and effluent ($Q_{comb} = Q_{gw} + Q_{eff}$)
C_{proj}	=	projected pollutant concentration (after available mixing)

The mass-balance equation has been arranged to calculate effluent limits so that the discharge does not cause or contribute to an exceedance of the most restrictive water quality standard. This equation can be applied to any effluent and receiving water where the applicable dilution ratio is known. This equation will only be used for nitrogen which has been authorized mixing (Section 4).

Equation 2:

$$C_{lmt} = C_{std} + D(C_{std} - C_{gw})$$

Where:
C_{lmt} = effluent limitation concentration
C_{std} = water quality standard concentration = 7.5 mg/L
C_{gw} = ambient receiving ground water concentration = 1.77 mg/L
D = dilution ratio (Q_{gw} / Q_{eff}) = 7880cfd / 2139cfd

$C_{lmt} = 7.5 + (7880/2139)(7.5 – 1.77)$ **= 28.6 mg/L**

A mass-balance approach is used to calculate the effluent quality of the discharge that meets the most restrictive water quality standard at the end of the mixing zone. Numeric effluent limitations are expressed as loads since this type of limitation inherently regulates both volume and strength of the effluent as prescribed by 75-5-402(3), MCA. Load limits ensure compliance with the ground water standards at the end of the mixing zone. Based on the proposed design capacity, the respective load effluent limitation is:

3.8 lb/day
[(8.34*10-6)* 28.6 mg/L*16,000 gpd]
as based on the following equation:

Equation 3:

$$L_{lmt} = CON * C_{eff} * DC_{eff}$$

Where:
L_{lmt} = effluent limitation-load
C_{eff} = allowable effluent concentration
DC_{eff} = design capacity of wastewater treatment system (gpd)
CON = conversion factor [$8.34*10^{-6}$]

The Final Effluent Limits are summarized in Table 8 for Outfall 001.